Monitoring Broadband America

Prepared by SamKnows Limited
for the Federal Communications Commission

In response to NBP PN #24

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Contents

1 Executive Summary

In response to the FCC's public notice on transparency, SamKnows would like to submit an overview document, for the provision of specialist monitoring services for Broadband America. This document includes a review of current performance monitoring solutions, including a detailed explanation of SamKnows' methods, and recommendations for the data the FCC would look to collect.

1.1 SamKnows: Monitoring Broadband America

Having carefully considered the FCC's requirements and taking into account our understanding of their fundamental objective (particularly bearing in mind our work with Ofcom, their UK equivalent), we propose a solution with the following elements:

- Statistically accurate data covering all major broadband networks across all fifty US states
- Continuous monitoring independent of home network configuration
- Industrial-grade testing, suitable for Government census level analysis
- Compliance with all relevant legislation.

SamKnows Broadband Monitoring

SamKnows was founded in 2003 to provide consumers with comparative data on the new market of ISPs which formed as a result of anti-monopoly legislation in the United Kingdom.

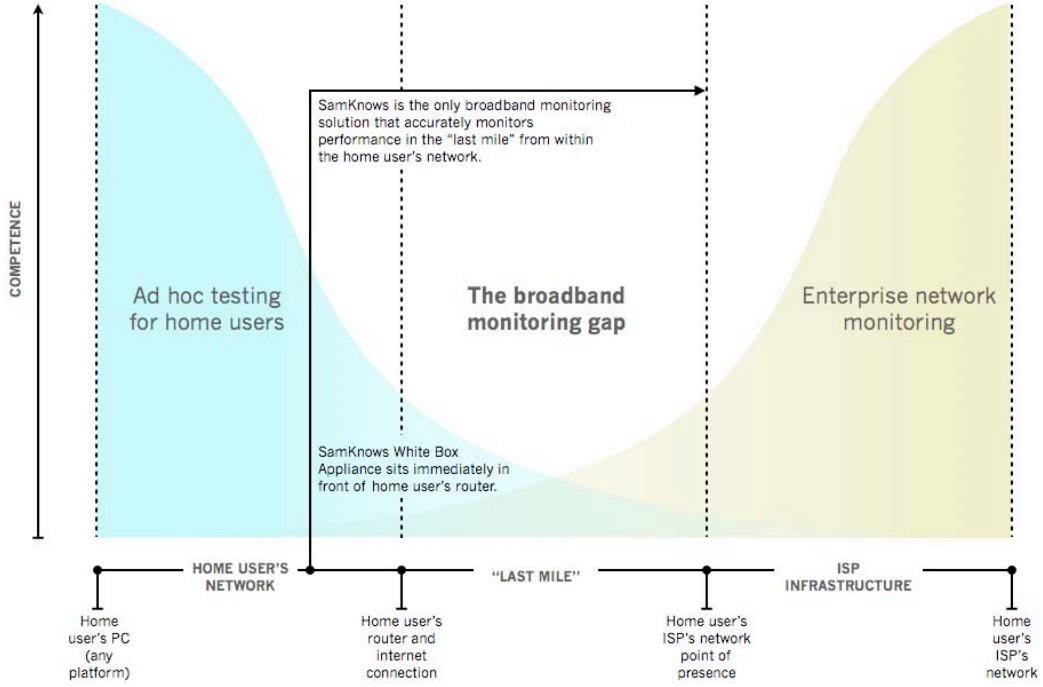
2008: Monitoring Broadband Britain

By 2008 it had established itself as the national authority on broadband service availability and expanded into independent broadband performance testing. That year the company formed a partnership with UK's Office of Communications—"Ofcom", the regulator and competition authority for the internet—to design and execute the world's first independent multi-ISP broadband study. The results from this project were widely reported in the national media and formed the basis of an official government ISP census.

Today, SamKnows maintains the only recognized, statistically accurate panel-based broadband monitoring service which continues to provide critical benchmark data to the major ISPs and internet network carriers.

1.2 The structure of the worldwide network monitoring market

SamKnows was founded to provide accurate broadband monitoring over the "last mile" from the home network to the ISP—the so-called "broadband monitoring gap". Prior to SamKnows, network monitoring solutions only existed either as software on a home user's PC, or at the ISP network level, with no ability to constantly monitor network performance between the home user's router and the demarcation point. The chart below shows this structure:



Ad hoc testing for home users	Enterprise network monitoring
Software installed locally on a home user's PC, or web based speed tests.	Enterprise level hardware network monitoring solutions installed by the ISPs on their networks.
These solutions cannot monitor a network constantly and, due to panel recruitment issues are impossible to aggregate into reliable data.	These solutions are excellent at monitoring an ISP's core network capability but, since they do not extend beyond a user's home network router, are not able to monitor the performance of the home user's connection over the critical "last mile".

2 Monitoring Broadband America

In general, the audience measurement industry faces six challenges:

1. **Panel recruitment**
   Has the panel been recruited legitimately, with the panelists' knowledge and consent?
2. **Panel weighting**
   Does the panel accurately represent, to a degree of statistical certainty, the relevant population?
3. **System for monitoring**
   Is the monitoring data captured without compromise and without requiring routine intervention by the panelist?
4. **Test design**
   Are the tests appropriate? Is the data and analysis accurate?
5. **Continuous panel purity**
   How can one be certain that the panel will continue to be relevant and appropriate for the ongoing monitoring program?
6. **Compliance**
   Has all relevant legislation been complied with?

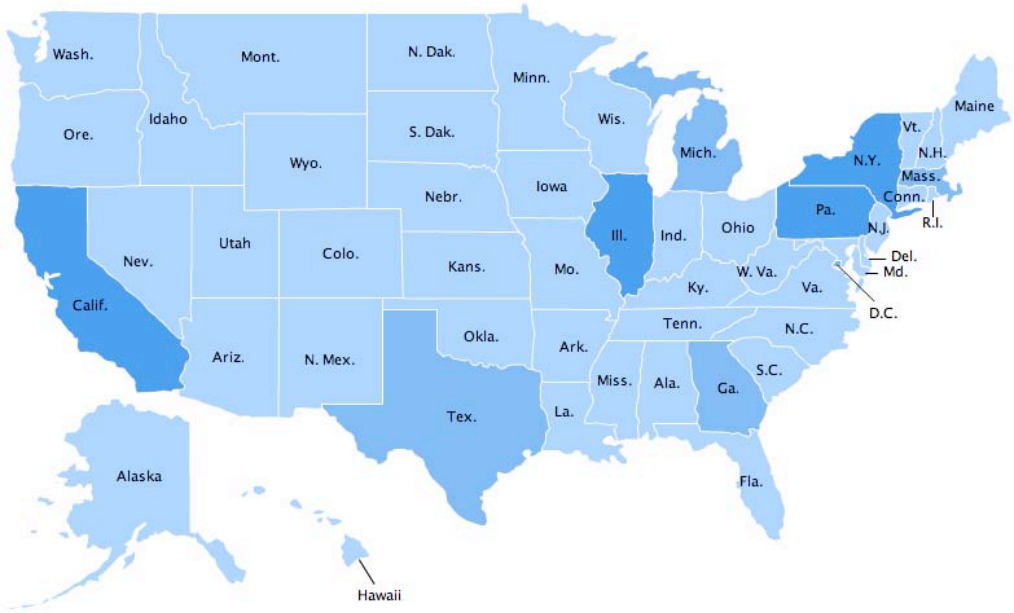
2.1 Panel recruitment / roll-out timings

To ensure integrity in panel recruitment, SamKnows employs an independent professional third party firm to recruit and vet a suitable pool of prospective panelists. This panel is being constructed in three phases using a multi-mode recruitment effort, with over-sampling, to yield a high target level of statistical confidence. In addition to the active pool, a dormant pool of additional panelists is maintained as standby for rotation, as needed, into the active panel and for custom panels for special client projects.

SamKnows	Others
Panel is independently recruited and verified by third party.	Panel "self-selects" and are not independently verified; typically panelists simply download monitoring software from a website (allegedly in some cases without their knowledge or consent).

Phased panel roll-out over fifty states

The FCC should look to recruit a US-based panel and deploy technology throughout all fifty states to cover a statistically significant sample of all major home broadband network operators.



Roll out phase	States (or District)	Key cities	Broadband population	Panelists recruited
I	California Illinois New York Pennsylvania	Los Angeles San Francisco Chicago New York Philadelphia	16.2 million	2,500
II	District of Columbia Georgia Massachusetts Michigan Texas	Washington Atlanta Boston Detroit Dallas	7.6 million	1,000
III	Remaining 42 states		45.6 million	6,500
			69.4 million	10,000

2.2 Panel weighting

To ensure integrity in the statistical sample, our independent third party panel recruiters use accepted methods of statistical sampling, such as consistent panel recruitment procedure and avoidance of potential pitfalls such as selection bias, coverage error, and panel attrition.

All audience measurement systems that intend to deliver analysis of large populations do so by extrapolating that information from data gathered from a specific audience sample. When chosen correctly, a relatively small sample size can form the basis for accurate analysis over a much larger population. For example, Nielsen Media Research provides universally accepted TV audience measurement data over the entire American population despite the fact that it directly monitors only 10,000 homes. This is possible because Nielsen's audience samples are carefully statistically weighted. BARB (the Broadcasters Audience Research Board in the UK) uses a similar methodology when determining the audience size and composition for television programming in the UK.

SamKnows uses information gathered by its panel recruiters to statistically weight its sample in a way that ensures that the data gathered leads to accurate results that represent the entire population of UK broadband users.

SamKnows	Others
Approximately 10,000 statistically weighted homes yielding a high degree of statistical confidence.	Varying numbers of randomly selected and unweighted, yielding statistically insignificant results.

2.3 System for monitoring

Any network monitoring system needs to be capable of monitoring and executing tests constantly—24 hours a day, 7 days a week—regardless of the number and kind of devices on a panelist's home network. Similar to the method used by the television audience measurement industry, SamKnows equips each member panel with a home unit, known as the SamKnows "White Box" Appliance, which is installed immediately in front of their home internet connection. This ensures that tests can be run at any time, even if all home computers are switched off.

SamKnows	Others
Proprietary "White Box" Appliance is physically installed on every panelist's home network, ensuring tests can be run at any time.	Software installed on a panelists' PC (usually Windows only) is only active when the PC is in use (compromising the test results), and cannot ever detect network activity from other home users.

2.4 Test design

As broadband users, over time, come to expect increasing capability from their networks, the tests used to measure general network speed, multimedia performance and network integrity must be suitably robust and well-designed. All SamKnows tests have been independently certified and/or approved not only by a pool of ISP clients but also by a national internet regulator.

SamKnows	Others
Independently certified and/or approved suite of tests for speed, multimedia performance and network integrity, as well as special projects.	Uncertified, unverifiable, generic bandwidth tests.

2.5 Continuous panel purity

In order for any panel to continue to produce reliable results it must be routinely re-verified to take account of changes that may affect panelist eligibility or statistical weighting. SamKnows employs an independent third party panel recruiter who regularly re-verifies, on a continual basis, its entire pool of panel candidates, including those in its active panel as well as its standby panel candidates.

SamKnows	Others
Regular re-verification of entire pool by independent third party.	Once a panelist, always a panelist.

2.6 Compliance

The services proposed in this document—especially as they involve the recruitment of a panel, the collection of personal data, and the monitoring and analysis of home broadband connections—carry with them a number of legal and protocol compliance obligations.

SamKnows enters into binding legal contracts with all of its candidate panelists and complies with all relevant legislation in all relevant jurisdictions. SamKnows is also compliant with the Office of Management and Budget surveying protocols and the guidelines set-out by CASRO (Council of American Survey Research Organisations).

SamKnows	Others
Legally contracted panel; all relevant legislation complied with, US Government approved panel recruitment methodology.	Typically EULA only and ambiguous data protection compliance. No adherence to US Government sampling requirements.

3 The SamKnows White Box

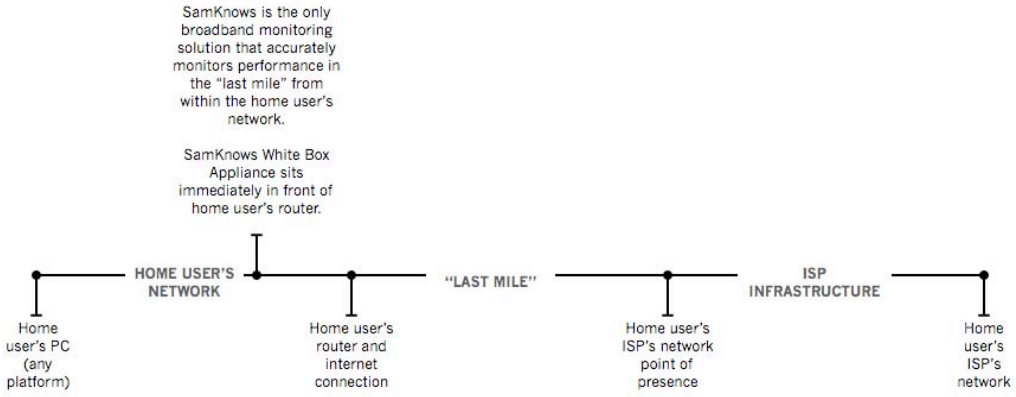
Each panelist receives a SamKnows White Box, which remains the property of SamKnows.

3.1 White Box Appliance specification

The White Box pack contains the panelist's detailed instructions, contract and license agreements, and the latest version of the SamKnows White Box Appliance—a bespoke hardware appliance that is installed directly in front of the home internet connection of each panelist.

The current version of the White Box Appliance is White Box 2.1, which is configured as follows:

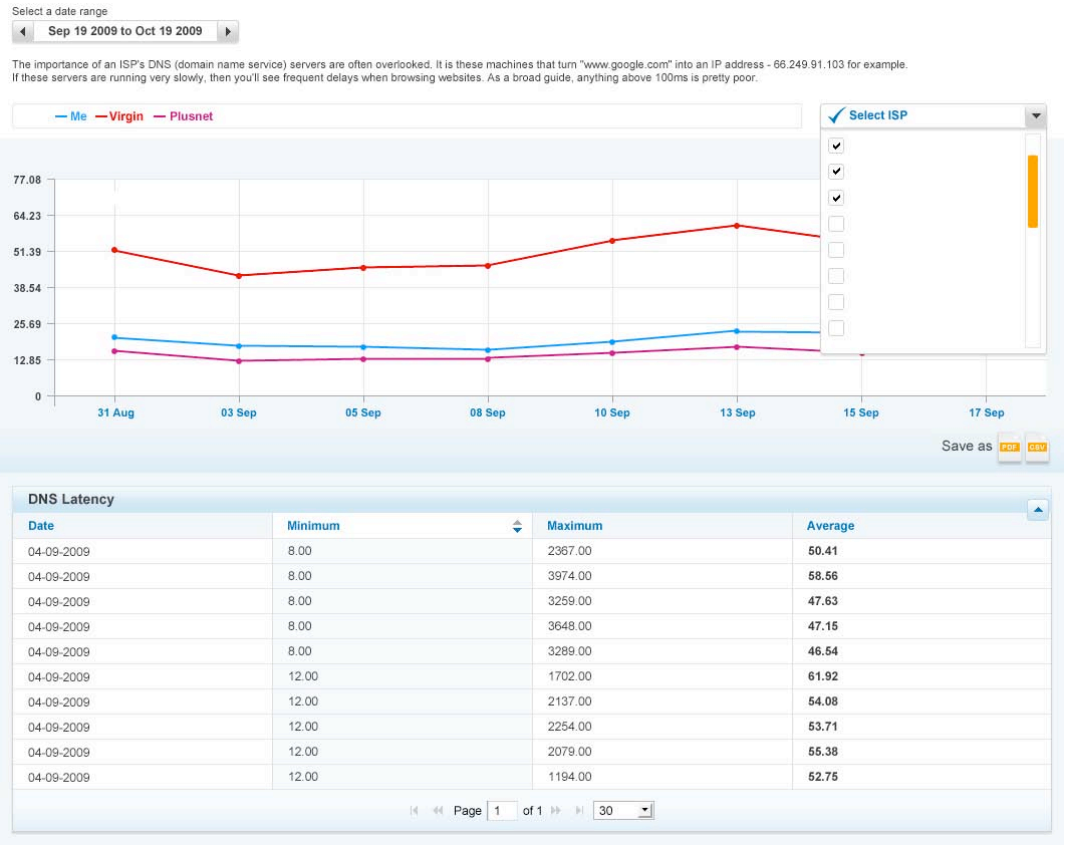
- A base Linksys (WRT54GL & WRT160NL) and Netgear (WNR3500L), 2.4 GHz Wireless Broadband Router specifically purchased and owned by SamKnows
- The Linux operating system, version 2.6 (as shipped with the router and licensed to the end user under the GPLA)
- A custom software package developed and owned by SamKnows and licensed to the panelists under the end user license agreement contained within their contract. The software on the SamKnows White Box can be remotely upgraded, modified, or wiped.



4 Reporting

The SamKnows panel monitors networks according to a series of proprietary and regulator-certified tests which provide results in three main areas:

1. **Speed**
   Web download and web upload speed, DNS response time, website load time and latency.
2. **Integrity**
   Packet loss, failed web requests and failed DNS queries within the network.
3. **Multimedia performance**
   Audio/visual packet loss, jitter and overall streaming performance.



The above figure shows a client's web download speed through the month of September 2009 compared with two competitor ISPs within a specific geographic region.

4.1 Real time reporting dashboard

Clients are able to monitor performance data in real time using the SamKnows online dashboard.

Performance graphs and statistical results are collected into the areas of speed, integrity and multimedia performance and are viewable both in dashboard overview format and in extended detail in each relevant section.

Each report is fully customizable for date range and comparative benchmarking.

4.2 Whose data can I see?

All data collected from panelists on a specific client network are fully disclosable to that client, including the detailed non-graphical data gathered.

Under the terms of our panel contracts and relevant data protection legislation, the client's network performance data is not disclosable to another competitor network. However, performance data from all networks is statistically weighted and combined into a number of benchmarks as a comparison for their own network's performance in each test area.

	Data from individual panelist's test results	Data from a specific ISP	Data from all ISPs
ISP Client	–	Yes (their own)	Aggregated long form
Corporate Client	–	–	Aggregated long form
Panelist	Yes (their own)	–	Aggregated short form
General public	–	–	Aggregated short form
Regulator	Yes	Yes	Yes

5 Why SamKnows

5.1 Towards a better measurement solution

The quality of both product and data analysis offered by broadband measurement services varies enormously. Perhaps due to its technical nature, it is unclear which precise standards these companies adhere to, or whether indeed there are any standards at all, while their clients wonder "Does these results really reflect our home customers' experience? Is this true for all of our home customers? Can I rely on these results at all?"

In answer to these and other questions, we offer the following "list of ten" not only as unique selling points, but also as a challenge to the rest of our fledgling industry.

5.2 Ten reasons…

Our clients choose SamKnows because the things we do are things that only we do. Here are ten.

Only SamKnows:

1. Monitors the entire home network rather than an individual PC.
2. Has been approved by the UK regulator (Ofcom).
3. Uses a statistically weighted panel recruited and verified by an independent third party.
4. Monitors ISP networks constantly, 24x7.
5. Legitimately and consensually contracts with all its panelists.
6. Uses the same statistical weighting methodologies currently used by the major television audience measurement systems such as BARB and Nielsen.
7. Regularly re-verifies its active panel.
8. Provides accurate network benchmark norms accepted by the UK regulator, the BBC and international commentators as statistically significant.
9. Complies with all relevant legislation regarding the collection and storage of data.
10. Maintains a dormant pool of additional panelists as standby for rotation into the active panel and custom panels for special client projects.